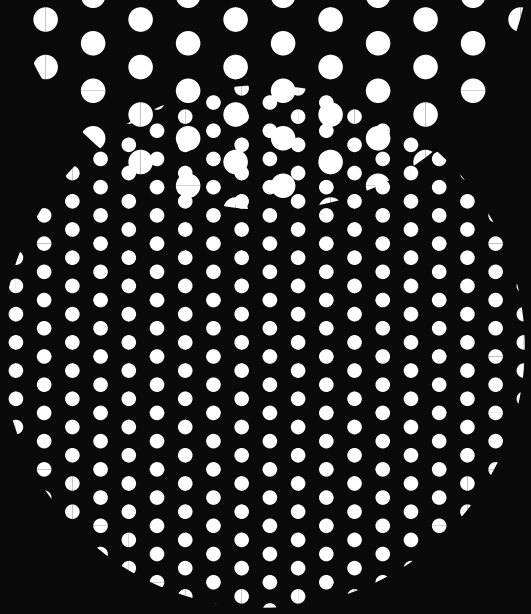


THE ABSURD OLYMPICS

Starter :

Given that $4^x = 9$ and $9^y = 64$, what is the value of xy?

$2^{2x} = 3^2$ $\quad (3^2)^y = 2^6$

substitute → $(2^{2x})^y = 2^6$

$2xy = 6$

$xy = 3$ YAY !!

Details

- Working in pairs (in real class or on zoom)
- You must write down you working
- Calculators are not permitted!
- Calculators are not permitted!
- Answers will be uploaded via a googleform

THIS GUY IS SERIOUS

CORRECT ANSWER +5 POINTS

INCORRECT ANSWER -3 POINTS

1.

Simplify the following. Leave your answer in the form $a\sqrt{b}$.

$$\sqrt{24}$$

$$= \sqrt{4}\sqrt{6} = 2\sqrt{6}$$

2.

Write the ratios in their simplest form.

$$\sqrt{8} : \sqrt{50} : \sqrt{128}$$

$\sqrt{4}\sqrt{2} : \sqrt{25}\sqrt{2} : \sqrt{64}\sqrt{2}$

$2 : 5 : 8$

3.

Expand and simplify where possible.

$$(2 + \sqrt{5})(3 - \sqrt{5})$$

$$= 6 - 2\sqrt{5} + 3\sqrt{5} - 5$$

$$= 1 + \sqrt{5}$$

4.

Expand and simplify where possible.

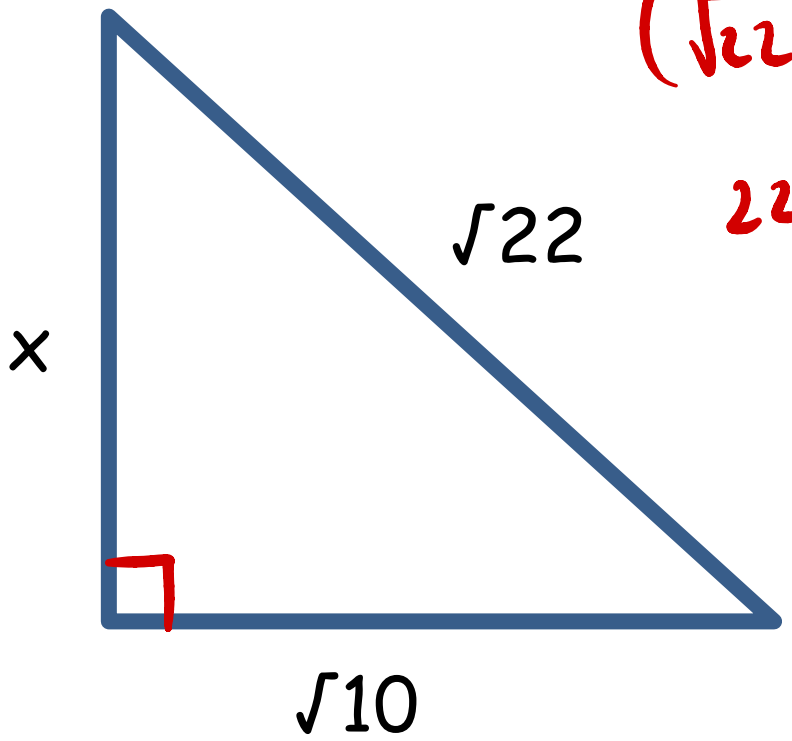
$$(3 - 2\sqrt{7})(4 + 3\sqrt{7})$$

$= 12 + 9\sqrt{7} - 8\sqrt{7} - 42$

$= \sqrt{7} - 30$

5.

Find the missing side length, giving your answer in as simple form as possible. All sides lengths are in centimetres.



$(\sqrt{22})^2 - (\sqrt{10})^2 = x^2$

$22 - 10 = x^2$

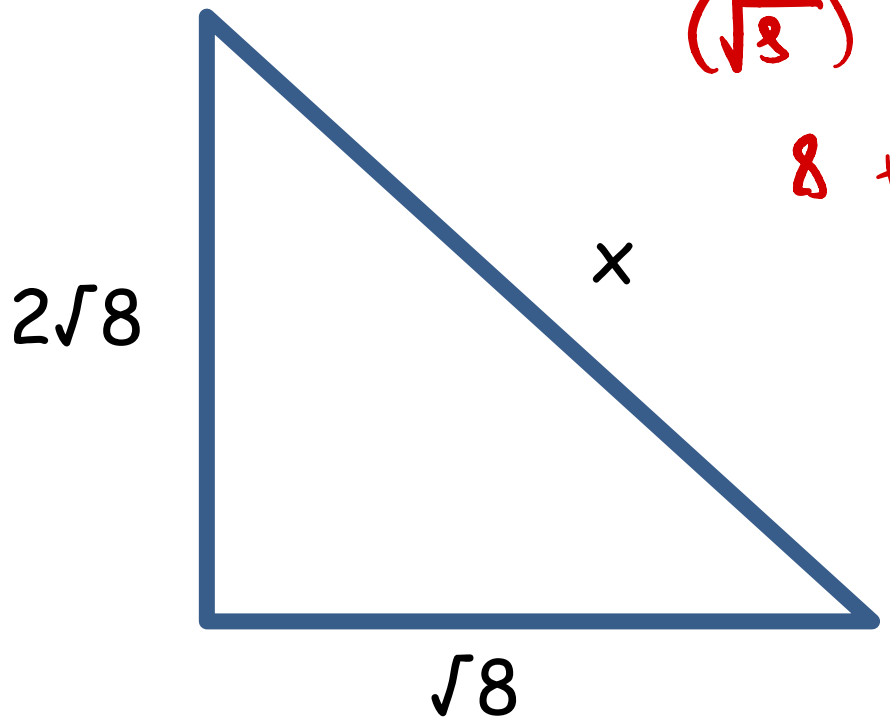
$12 = x^2$

$x = \sqrt{12}$

$= 2\sqrt{3}$ cm

6.

Find the missing side length, giving your answer in as simple form as possible. All sides lengths are in centimetres.



$(\sqrt{8})^2 + (2\sqrt{8})^2 = x^2$

$8 + 32 = x^2$

$40 = x^2$

$x = 2\sqrt{10}$ cm

7.

Calculate the area of the rectangle, simplifying your answer where possible. All sides lengths are in metres.

$(1+\sqrt{3})(2-\sqrt{3}) = 2 - \sqrt{3} + 2\sqrt{3} - 3$

$= (\sqrt{3} - 1)\,m^2$

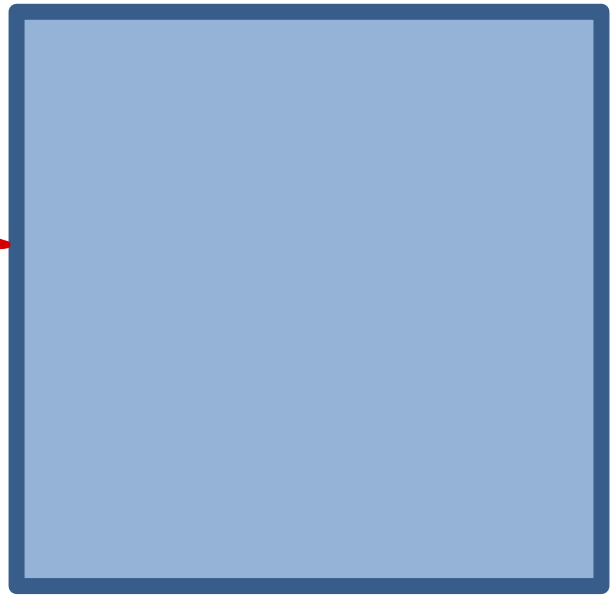
8.

Calculate the area of the square, give your answer in the form $a + b\sqrt{3}$. All sides lengths are in metres.

$(2+\sqrt{3})(2+\sqrt{3})$

$= 4 + 4\sqrt{3} + 3$

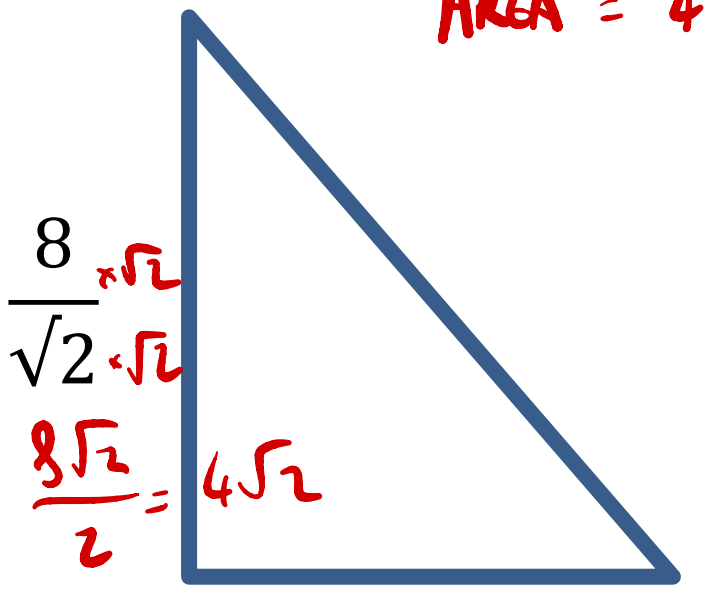
$= (7 + 4\sqrt{3})\,m^2$



$2 + \sqrt{3}$

9.

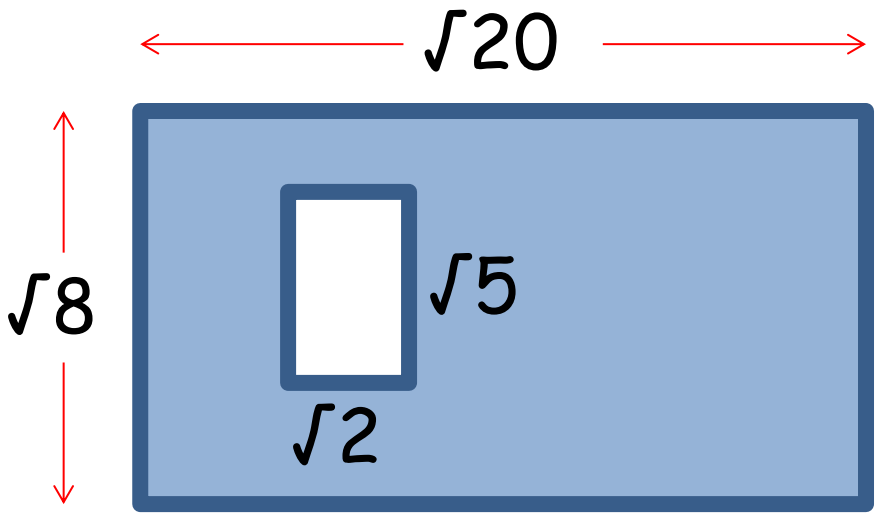
Calculate the area of the triangle, give your answer as an integer. All sides lengths are in metres.



AREA $= 4\sqrt{2} \times 3\sqrt{2} = 24\ m^2$

10.

A large rectangle piece of card is $\sqrt{20}$ cm long and $\sqrt{8}$ cm wide.
A small rectangle $\sqrt{2}$ cm long and $\sqrt{5}$ cm wide is cut out of the piece of card.
Express the area of the card that is left as a percentage of the area of the large rectangle



$$\frac{\sqrt{20}\times\sqrt{8} - \sqrt{2}\sqrt{5}}{\sqrt{20}\times\sqrt{8}}$$

$$= \frac{\sqrt{160} - \sqrt{10}}{\sqrt{160}}$$

$$= \frac{4\sqrt{10} - \sqrt{10}}{4\sqrt{10}}$$

$$= \frac{3\sqrt{10}}{4\sqrt{10}} = \frac{3}{4} = 75\%$$

11.

Rationalise the denominators of the following, give your answer in its simplest form.

$$\frac{(12 - \sqrt{6})}{\sqrt{3}} \times\sqrt{3}$$

$$= \frac{12\sqrt{3} - \sqrt{18}}{3} \quad \times\sqrt{3}$$

$$= \frac{12\sqrt{3} - 3\sqrt{3}}{3}$$

$$= 3\sqrt{3}$$

12.

Rationalise the denominators of the following, give your answer in its simplest form.

$$\frac{(2+\sqrt{3})(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$$

$$= \frac{2\sqrt{3}+2+3+\sqrt{3}}{3-1}$$

$$= \frac{3\sqrt{3}+5}{2}$$

13.

An engineer uses a formula to work out the number of metres of cable he needs to complete a job. His calculator displays the answer $10 \sqrt{\ } 70$. The button for converting this to a decimal is not working.

He has 80 metres of cable. Without using a calculator decide whether he has enough cable. Show clearly how you decide.

$80 = \sqrt{6400}$

$10\sqrt{70} = \sqrt{100}\sqrt{70} = \sqrt{7000}$

As $\sqrt{7000} > \sqrt{6400}$

he has enough cable

14.

Work out the mean of $\sqrt{50}$, $\sqrt{18}$ and $\sqrt{8}$.

Give your answer in the form $a\sqrt{2}$.

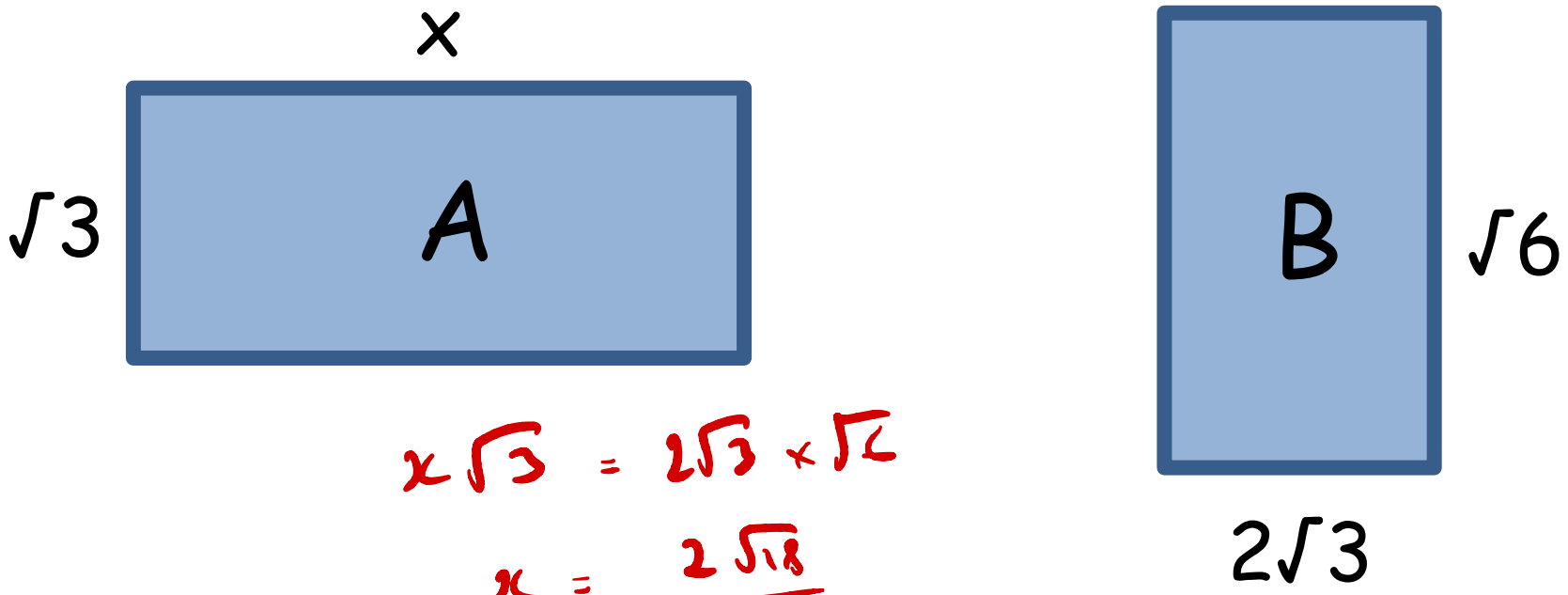
$$\frac{\sqrt{50} + \sqrt{18} + \sqrt{8}}{3} = \frac{5\sqrt{2} + 3\sqrt{2} + 2\sqrt{2}}{3}$$

$$= \frac{10\sqrt{2}}{3}$$

$$= \frac{10}{3}\sqrt{2}$$

15.

The area of rectangle A is the same as the area of rectangle B.
Find the value of x. Give your answer in the form $a\sqrt{6}$



$x\sqrt{3} = 2\sqrt{3} \times \sqrt{2}$

$x = \frac{2\sqrt{18}}{\sqrt{3}}$

$x = \frac{2 \times 3\sqrt{2}}{\sqrt{3}} = \frac{6\sqrt{2}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{6\sqrt{6}}{3} = 2\sqrt{6}$

16 The area of a triangle is $10\sqrt{5}$ cm^2. It is enlarged by a scale factor of $3\sqrt{2}$. What is the area of the enlarged triangle?

Linear scale factor $\times 3\sqrt{2}$

Area scale factor $(\times 3\sqrt{2})^2$

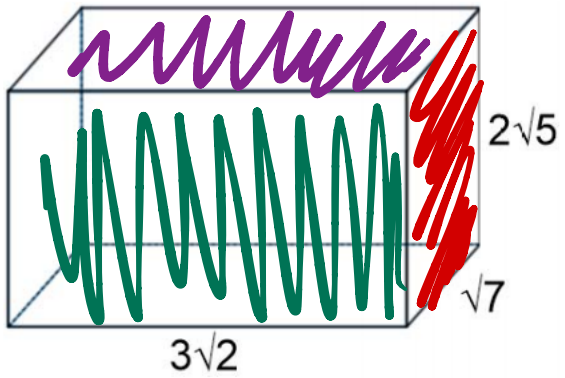
$10\sqrt{5} \times (3\sqrt{2})^2$

$= 10\sqrt{5} \times 9 \times 2$

$= 180\sqrt{5}$

17

Surface Area?



$= 2(2\sqrt{5} \times \sqrt{7}) + 2(3\sqrt{2} \times 2\sqrt{5}) + 2(3\sqrt{2} \times \sqrt{7})$

$= 4\sqrt{35} + 12\sqrt{10} + 6\sqrt{14}$

13

If $\sqrt{2}+\sqrt{2}+\sqrt{2}+\sqrt{2}=4^x$, what is x?

$4 \times 2^{\frac{1}{2}} = 4^x$

$2^2 \times 2^{\frac{1}{2}} = 2^{2x}$

$2^{2.5} = 2^{2x}$

$2x = 2.5$

$x = \frac{5}{4}$ or 1.25

19.

Write $\frac{26}{\sqrt{2}} - \frac{12}{\sqrt{18}} + 2\sqrt{50}$ in the form $a\sqrt{2}$ where a is an integer

whole number

$= \frac{26\sqrt{2}}{2} - \frac{12\sqrt{18}}{18} + 2\sqrt{25}\sqrt{2}$

$= 13\sqrt{2} - \frac{36\sqrt{2}}{18} + 10\sqrt{2}$

$= 26\sqrt{2} - 2\sqrt{2}$

$= 24\sqrt{2}$

20.

A shed has dimensions, in metres, of

$$\text{height} = \sqrt{5}, \quad \text{width} = \sqrt{6} \text{ and length} = \frac{9}{\sqrt{2}}$$

Find the volume of the shed.
Give your answer in the form $a\sqrt{15}$, where a is an integer.

$$V = \sqrt{5}\sqrt{6} \times \frac{9\sqrt{2}}{2}$$

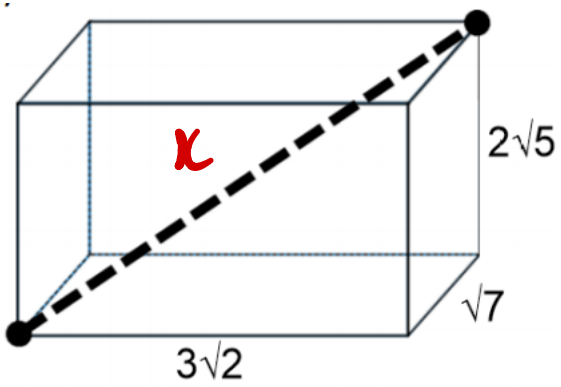
$$= \frac{9\sqrt{60}}{2}$$

$$= \frac{9 \times \sqrt{4}\sqrt{15}}{2}$$

$$= \frac{18\sqrt{15}}{2} = 9\sqrt{15}$$

21.

Calculate the length of the dotted line.



$x = \sqrt{(3\sqrt{2})^2 + (\sqrt{7})^2 + (2\sqrt{5})^2}$

$= \sqrt{18 + 7 + 20}$

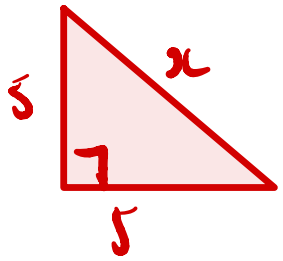
$= \sqrt{45}$

$= 3\sqrt{5}$

22.

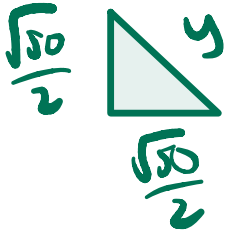
The midpoints of the sides of a square of side 10cm are joined to form another square. This process is then repeated to create the shaded square.

Find the area of the shaded square.



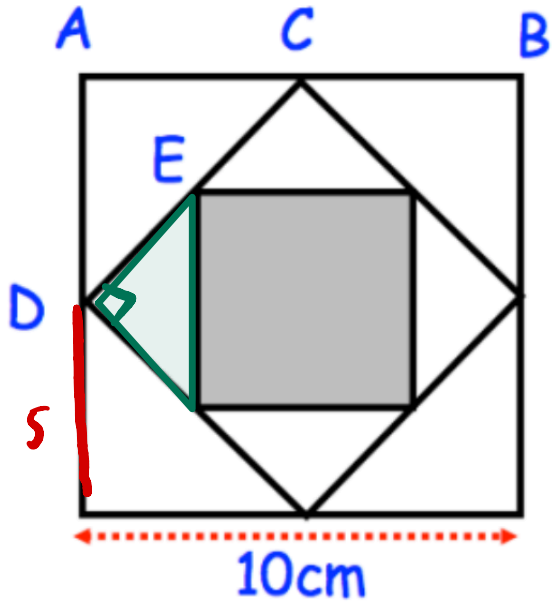
$x = \sqrt{5^2 + 5^2}$

$= \sqrt{50}$



$y = \sqrt{\left(\frac{\sqrt{50}}{2}\right)^2 + \left(\frac{\sqrt{50}}{2}\right)^2}$

$= \sqrt{\frac{50}{4} + \frac{50}{4}} = \sqrt{\frac{100}{4}} = \frac{10}{2} = 5$



AREA $= 5 \times 5 = 25\text{cm}^2$

23.

Rationalise the denominator of

$$\frac{(a+\sqrt{4b})(a+\sqrt{4b})}{(a-\sqrt{4b})(a+\sqrt{4b})} = \frac{a^2+a\sqrt{4b}+a\sqrt{4b}+4b}{a^2-4b}$$

where a is an integer and b is a prime number.
Simplify your answer.

$$= \frac{a^2+2a\sqrt{4b}+4b}{a^2-4b}$$

$$= \frac{a^2+4a\sqrt{b}+4b}{a^2-4b}$$